

**WHAT IS CLAIMED IS:**

- 1           1.     A primary lithium battery comprising:  
2           an anode including a lithium-containing anode active material;  
3           a cathode;  
4           a separator between the anode and the cathode; and  
5           a positive lead including aluminum in contact with a portion of the cathode.
- 1           2.     The battery of claim 1, wherein the lithium-containing anode active material is  
2           lithium or a lithium alloy.
- 1           3.     The battery of claim 1, wherein the positive lead includes a 1000 series  
2           aluminum, 2000 series aluminum alloy, a 3000 series aluminum alloy, a 5000 series  
3           aluminum alloy, a 6000 series aluminum alloy, or a 7000 series aluminum alloy.
- 1           4.     The battery of claim 1, wherein the positive lead includes a 5000 series  
2           aluminum alloy.
- 1           5.     The battery of claim 1, wherein the positive lead includes an aluminum alloy  
2           including 0-0.4% by weight of chromium.
- 1           6.     The battery of claim 1, wherein the positive lead includes an aluminum alloy  
2           including 0.01-6.8% by weight of copper.
- 1           7.     The battery of claim 1, wherein the positive lead includes an aluminum alloy  
2           including 0.05-1.3% by weight of iron.
- 1           8.     The battery of claim 1, wherein the positive lead includes an aluminum alloy  
2           including 0.1-7% by weight of magnesium.
- 1           9.     The battery of claim 1, wherein the positive lead includes an aluminum alloy  
2           including 0-2% by weight of manganese.
- 1           10.    The battery of claim 1, wherein the positive lead includes an aluminum alloy  
2           including 0-2% by weight of silicon.

1           11.     The battery of claim 1, wherein the positive lead includes an aluminum alloy  
2 including less than 0.25% by weight of titanium.

1           12.     The battery of claim 1, wherein the positive lead includes an aluminum alloy  
2 including 0-2.3% by weight of nickel,.

1           13.     The battery of claim 1, wherein the positive lead includes an aluminum alloy  
2 including 0-8.2% by weight of zinc.

1           14.     The battery of claim 1, wherein the cathode includes a current collector  
2 including aluminum.

1           15.     The battery of claim 14, wherein the current collector includes a 1000 series  
2 aluminum, a 2000 series aluminum alloy, a 3000 series aluminum alloy, a 5000 series  
3 aluminum alloy, a 6000 series aluminum alloy, or a 7000 series aluminum alloy.

1           16.     The battery of claim 14, wherein the current collector includes a 6000 series  
2 aluminum alloy.

1           17.     The battery of claim 14, wherein the current collector includes an aluminum  
2 alloy including 0-0.4% by weight of chromium, 0.01-6.8% by weight of copper, 0.05-1.3%  
3 by weight of iron, 0.1-7% by weight of magnesium, 0-2% by weight of manganese, 0-2% by  
4 weight of silicon, less than 0.25% by weight of titanium, 0-2.3% by weight of nickel, and 0-  
5 8.2% by weight of zinc.

1           18.     The battery of claim 1, wherein the positive lead includes an extension  
2 directed toward the cathode.

1           19.     The battery of claim 1, wherein the positive lead includes four or more  
2 extensions directed toward the cathode.

1           20.     The battery of claim 1, wherein the positive lead includes six or more  
2 extensions directed toward the cathode.

1           21.     The battery of claim 1, further comprising a nonaqueous electrolyte in contact  
2 with the anode, the cathode and the separator.

1           22.     The battery of claim 21, wherein the nonaqueous electrolyte includes an  
2     organic solvent.

1           23.     The battery of claim 21, wherein the nonaqueous electrolyte includes a  
2     perchlorate salt.

1           24.     The battery of claim 1, wherein the cathode includes a manganese dioxide,  
2     iron disulfide, a  $\text{CF}_x$ , or a vanadate.

1           25.     The battery of claim 1, wherein the battery is a cylindrical battery.

1           26.     The battery of claim 1, wherein the battery has an impedance of less than  
2     0.150 Ohms.

1           27.     The battery of claim 1, wherein the battery has an impedance of less than  
2     0.130 Ohms.

1           28.     The battery of claim 1, wherein the battery has an impedance that increases by  
2     less than 0.20 Ohms after the battery is dropped six times from a height of one meter onto a  
3     hard surface.

1           29.     The battery of claim 1, wherein the positive lead is welded to a portion of the  
2     cathode.

1           30.     A primary lithium battery comprising:  
2     an anode including a lithium-containing anode active material;  
3     a cathode including a current collector including aluminum;  
4     a separator between the anode and the cathode; and  
5     a positive lead including aluminum in contact with the cathode.

1           31.     The battery of claim 30, wherein the current collector and the positive lead  
2     each independently include a 1000 series aluminum, a 2000 series aluminum alloy, a 3000  
3     series aluminum alloy, a 5000 series aluminum alloy, a 6000 series aluminum alloy, or a 7000  
4     series aluminum alloy.

1           32.     The battery of claim 30, wherein the current collector includes 6000 series  
2 aluminum alloy and the positive lead includes a 5000 series aluminum alloy.

1           33.     The battery of claim 30, wherein the current collector and the positive lead  
2 each include an aluminum alloy including 0-0.4% by weight of chromium, 0.01-6.8% by  
3 weight of copper, 0.05-1.3% by weight of iron, 0.1-7% by weight of magnesium, 0-2% by  
4 weight of manganese, 0-2% by weight of silicon, less than 0.25% by weight of titanium, 0-  
5 2.3% by weight of nickel, and 0-8.2% by weight of zinc.

1           34.     The battery of claim 30, wherein the positive lead includes an extension  
2 directed toward the cathode.

1           35.     The battery of claim 30, wherein the positive lead includes four or more  
2 extensions directed toward the cathode.

1           36.     The battery of claim 30, wherein the positive lead includes six or more  
2 extensions directed toward the cathode.

1           37.     A method of making a primary lithium battery comprising:  
2 placing a cathode in a housing; and  
3 contacting the cathode with a positive lead including aluminum.

1           38.     The method of claim 37, wherein the positive lead includes a 1000 series  
2 aluminum, a 2000 series aluminum alloy, a 3000 series aluminum alloy, a 5000 series  
3 aluminum alloy, a 6000 series aluminum alloy, or a 7000 series aluminum alloy.

1           39.     The method of claim 37, wherein the positive lead includes a 5000 series  
2 aluminum alloy.

1           40.     The method of claim 37, wherein the positive lead includes an aluminum alloy  
2 including 0-0.4% by weight of chromium, 0.01-6.8% by weight of copper, 0.05-1.3% by  
3 weight of iron, 0.1-7% by weight of magnesium, 0-2% by weight of manganese, 0-2% by  
4 weight of silicon, less than 0.25% by weight of titanium, 0-2.3% by weight of nickel, and 0-  
5 8.2% by weight of zinc.

1           41.    The method of claim 37, wherein the cathode includes a current collector  
2 including aluminum.

1           42.    The method of claim 41, wherein the current collector includes a 1000 series  
2 aluminum, a 2000 series aluminum alloy, a 3000 series aluminum alloy, a 5000 series  
3 aluminum alloy, a 6000 series aluminum alloy, or a 7000 series aluminum alloy.

1           43.    The method of claim 41, wherein the positive lead and the current collector  
2 each independently include a 1000 series aluminum, a 2000 series aluminum alloy, a 3000  
3 series aluminum alloy, a 5000 series aluminum alloy, a 6000 series aluminum alloy, or a 7000  
4 series aluminum alloy.

1           44.    The method of claim 43, wherein the current collector includes a 6000 series  
2 aluminum alloy.

1           45.    The method of claim 37, wherein the housing is a cylindrical housing.

1           46.    The method of claim 37, wherein the positive lead includes an extension  
2 directed toward the cathode.

1           47.    The method of claim 37, wherein the positive lead includes four or more  
2 extensions directed toward the cathode.

1           48.    The method of claim 37, wherein the positive lead includes six or more  
2 extensions directed toward the cathode.

1           49.    The method of claim 37, wherein the cathode includes a manganese dioxide,  
2 iron disulfide, a  $CF_x$ , or a vanadate.

1           50.    The method of claim 37, further comprising placing a nonaqueous electrolyte  
2 in the housing.

1           51.    The method of claim 50, wherein the nonaqueous electrolyte includes an  
2 organic solvent.

1           52.     The method of claim 51, wherein the nonaqueous electrolyte includes a  
2     perchlorate salt.

1           53.     The method of claim 38, wherein contacting includes welding.